COMPARISON OF 2% LIDOCAINE AND 0.5% BUPIVACAINE WITH 2% LIDOCAINE AND 0.75% ROPIVACAINE IN PERIBULBAR BLOCK FOR CATARACT SURGERY

Dissertation Submitted in partial fulfillment of

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M.D. ANAESTHESIOLOGY- BRANCH X

CHENGALPATTU MEDICAL COLLEGE, CHENGALPATTU.

THE TAMILNADU DR. M. G. R. MEDICAL UNIVERSITY

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CERTIFICATE

This is to certify that this dissertation titled **"COMPARISON OF 2% LIDOCAINE AND 0.5% BUPIVACAINE WITH 2% LIDOCAINE AND 0.75% ROPIVACAINE IN PERIBULBAR BLOCK FOR CATARACT SURGERY "** has been prepared by **Dr.. S Ramadevi** under my supervision in the Department of Anaesthesiology, Chengalpattu Medical College and Hospital, Chengalpattu during the academic period 2008-2011 and is being submitted to the Tamilnadu Dr. M. G. R. Medical University, Chennai in partial fulfillment of the University regulations for the award of the Degree of Doctor of Medicine (Branch X – M.D. Anaesthesiology) and her dissertation is a bonafide work.

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DECLARATION

I, **Dr. S.Ramadevi**, solemnly declare that the dissertation **"COMPARISON OF 2% LIDOCAINE AND 0.5% BUPIVACAINE WITH 2% LIDOCAINE AND 0.75% ROPIVACAINE IN PERIBULBAR BLOCK FOR CATARACT SURGERY"** is a bonafide work done by me in the Department of Anaesthesiology, Chengalpattu Medical College & Hospital, Chengalpattu, after getting approval from the Ethical Committee, under the able guidance of PROF. DR. N.KRISHNAN, M.D.,D.A, Professor and Head of the Department of Anaesthesiology, Chengalpattu Medical College, Chengalpattu.

Place: Chengalpattu,

Date: **Dr. S.Ramadevi.**

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INDEX

INTRODUCTION

Most of the surgeries within the orbit can be performed under regional anaesthesia. Cataract surgery is routinely carried out under regional anaesthesia in our institution.

Regional anaesthesia for ophthalmic surgery may be administered by anaesthesiologist, provided they receive appropriate training in performing the technique and are fully conversant with the associated risks and complications and can treat them accordingly. Regional anaesthesia[1] is a better alternative, whenever general anesthesia is undesireable or contraindicated.

Retrobulbar and peribulbar blocks [1,2,3] provide adequate anaesthesia for surgery on the cornea, anterior chamber and lens. Concern over complications associated with retrobulbar block and need for an accessory block of the facial nerve to prevent activity of the orbicularis oculi muscle led to the pursuit of peribulbar block technique in ophthalmic anaesthesia. [2,3,4]

Peribulbar block is considered preferable over retrobulbarblock in achieving anesthesia for intraocular and extraocular surgeries. Peribulbar

block is widely used, because it is easier to perform and less painful. Has a higher margin of safety and equally effective without the need for accessory facial nerve block. Local anesthetic solution is deposited within the orbit but outside the muscle cone. Kelman was first known to have performed this technique in 1970. In 1985, Davis & Mandel [5,6] reported the use of peribulbar block. Davis & Mandel reviewed 16,225 peribulbar blocks and found them to be effective with a very low complication rate.

In our study, we compare the efficacy of peribulbar block in cataract surgery using the combination of 1:1 mixture of 2% lidocaine with 0.5% bupivacaine and 1:1 mixture of 2% lidocaine with 0.75% ropivacaine regarding the time required for onset of surgical anaesthesia and quality of postoperative analgesia.

AIM OF THE STUDY

To evaluate the efficacy of peribulbar block with the combination of **2% Lidocaine and 0.75% Ropivacaine in comparison** with **2% Lidocaine and 0.5% Bupivacaine** for cataract surgery .

ANATOMY AND NERVE

SUPPLY OF THE EYEBALL

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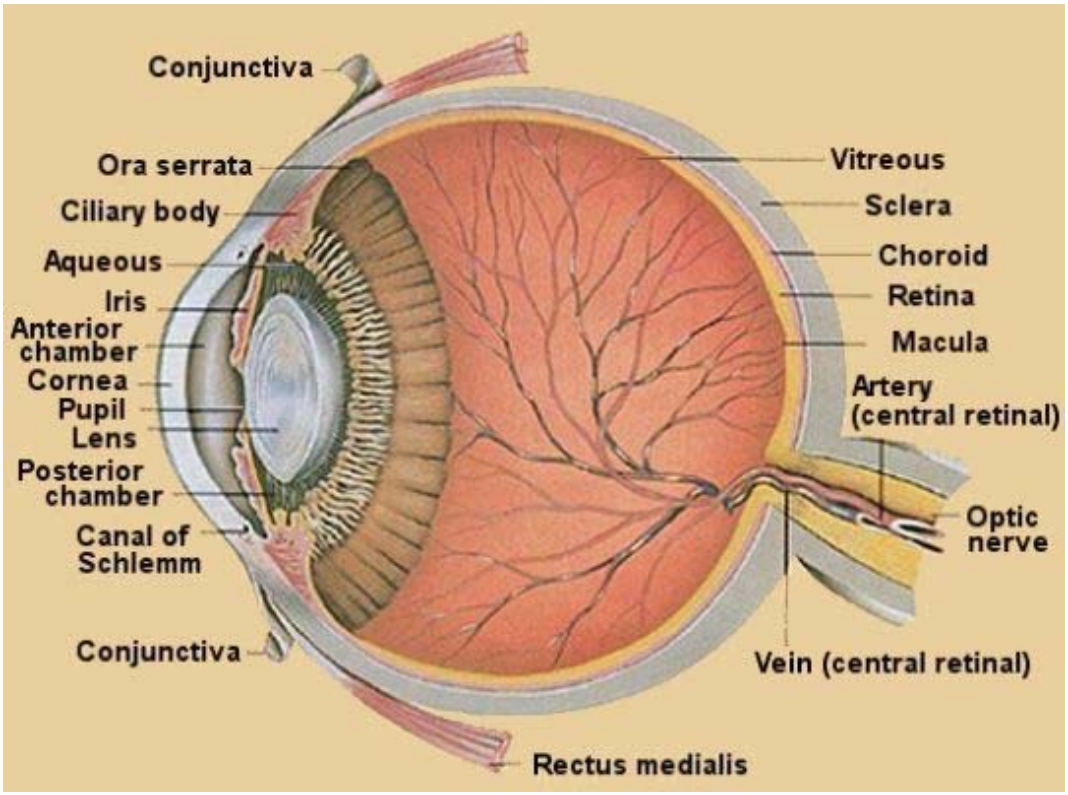


VERTICAL SECTION OF THE RIGHT EYE

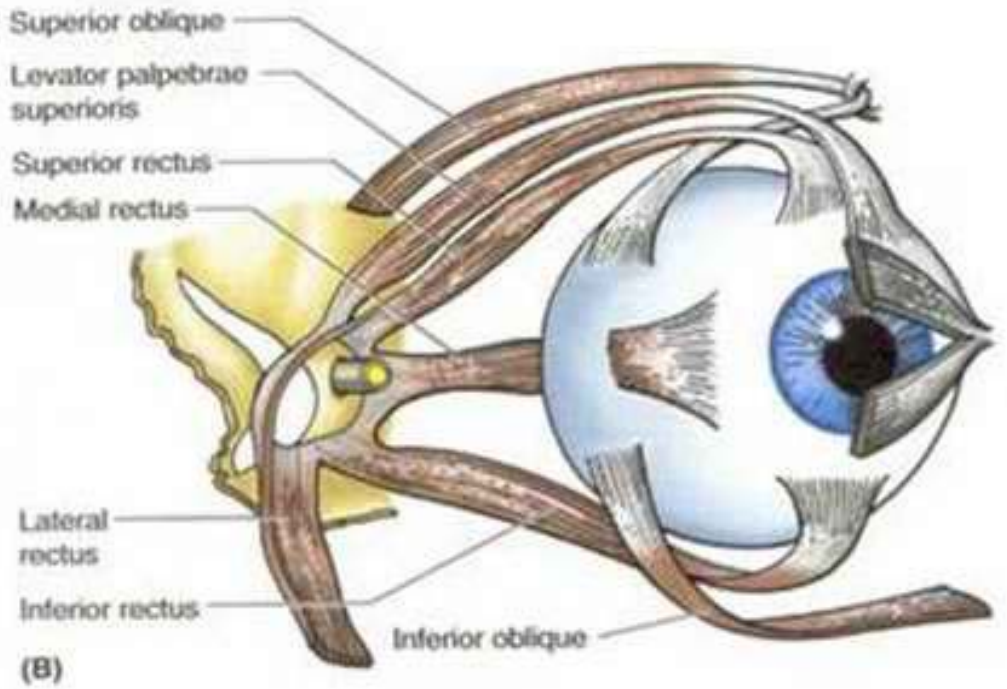
ANATOMY AND NERVE SUPPLY OF THE EYEBALL

THE ORBIT

It is 40 -50 mm deep and pyramidal in shape with its base at the orbital opening and its apex pointing to the optic foramen. Its volume is approximately 30ml, which about 7 ml is occupied by the globe and its muscle cone, and the remainder by loose connective tissue through which local anaesthetic solutions can spread. The lateral walls of both orbits form an angle of 90˚ to each other and the angle between the medial and lateral wall of each orbit is 45˚. The medial wall is parallel to the sagittal plane.

THE GLOBE

The eyeball is situated in the anterior part of the orbital cavity closer to the roof than the floor and nearer the lateral than the medial wall. This relationship is important when considering needle access , which is usually either medially or inferolaterally where the gap between globe and orbital wall is greatest.



SUPEROLATERAL ASPECT OF THE RIGHT EYE.

Extraocular muscles

SCLERA

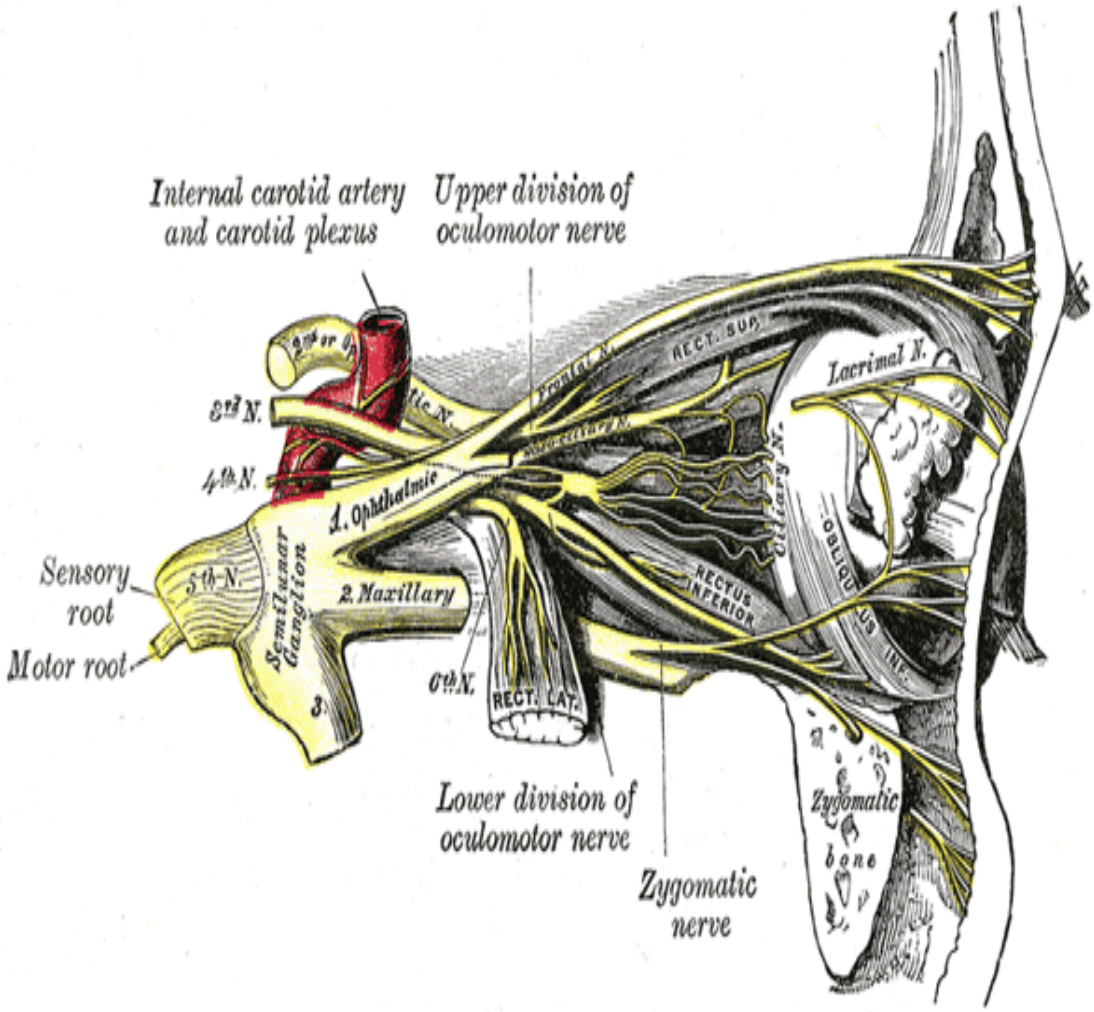
It forms the fibrous layer of the eyeball. It is about 1 mm thick in the adult. The sclera is relatively tough, but is easily pierced by needles. Deep to the sclera is the uveal tract, which comprises the ciliary body , iris and choroid layer. Superficial to, and enclosing the sclera is the membranous Tenon's capsule, lying directly underneath the conjunctiva.

EXTRAOCULAR MUSCLES:

The four recti and two oblique muscles control eye movement and influence intra ocular pressure. The lateral rectus is innervated by the abducent nerve [VI cranial nerve] , the superior oblique by the trochlear nerve [IV cranial nerve] and the rest by the oculomotor nerve [III cranial nerve]. Nerves enter the muscles on their intraconal surface, with the exception of the superior oblique. The cranial nerves enter the cone and pierce the muscles on their intraconal surface.

The sensory supply is through the branches of the trigeminal [V cranial nerve] nerve. The first division of the trigeminal nerve [ophthalmic nerve] enters the orbit via the superior orbital fissure and supplies branches intraconally to the sclera and cornea. After leaving the orbit via the superior orbital notch it supplies to the upper lid and conjunctiva extraconally. The second division of the trigeminal

Nerve supply of the eye (lateral view)



[maxillary nerve] enters the orbit via the inferior orbital fissure. Branches of this nerve are entirely extraconal and supply the lower lid and inferior conjunctiva after leaving the orbit via the inferior orbital foramen.

The Ciliary Ganglion

It is a small quadrilateral body about the size of pin's head situated between the optic nerve & lateral rectus near the apex of the orbit. It has 3 roots:

1) Sensory root arises from naso-ciliary nerve. The fibres do not relay in the ciliary ganglion

2) Parasympathetic root comes from 3rd cranial nerve. The fibers relay in the ganglion.

3) Sympathetic root arises from the sympathetic plexuses around the internal carotid artery. They are post-ganglionic fibers, and pass through the ganglion without further relay. The ciliary ganglion gives 6 - 10 short ciliary nerves which contain the 3 types of innervation.

PERIBULBAR BLOCK

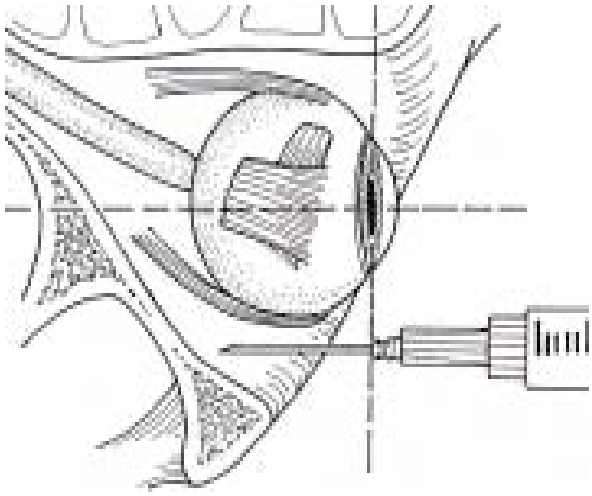
There are various techniques to administer a peribulbar block. Single injection technique provides [7,9,10] adequate anaesthesia, although akinesia is not guaranteed. The most commonly used single injection technique is an inferolateral injection. In ophthalmic practice, complete akinesia is seldom required.

Two-site injection technique involving inferotemporal and superonasal sites achieves complete akinesia of the eyeball. The anaesthetsiologist should explain the anaesthetic technique to the patient in clear, vernacular language, with appropriate reassurance. All monitoring and anaesthetic equipments in both the anaesthetic room and operating room should be checked. All drugs and equipments for resuscitation should be readily available. Consent of the patient to surgery and anaesthesia should be obtained and verified.

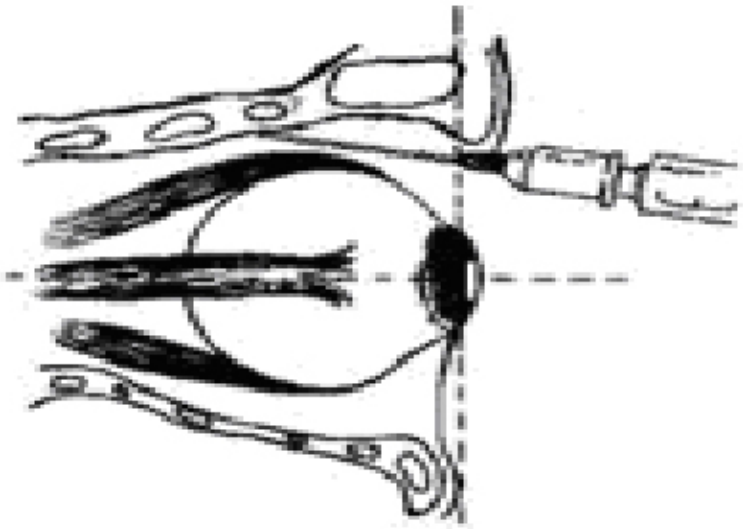
The axial length of the eye should be confirmed by ultrasound scan. Intravenous access with an indwelling canula should be established before performing the block. ECG, non invasive blood pressure & oxygen saturation of the patients are monitored.

PERIBULBAR BLOCK

PERIBULBAR BLOCK–Inferotemporal injection



PERIBULBAR BLOCK – Superonasal injection



Peribulbar block using two injection technique : [6,8,9,10]

- Both the upper and lower eye lids were cleaned with 5% solution of Povidone Iodine swab.
- The patient is placed in supine position and asked to look straight.
- A 10 ml syringe with a 22 gauge, 25 mm needle is used to perform the block

The needle is inserted in the inferotemporal region through the skin, at the junction of medial 2/3rd and lateral 1/3rd of the lower orbital margin. Once the needle is under the globe, it is directed along the orbital floor up to the depth of the mid-orbit in the lateral extra conal space and not in an upward and inward direction to avoid injury to optic nerve. After careful negative aspiration, 5 ml of local anesthetic is given.

The second injection [11] was given in the superonasal area by inserting the same needle through the upper eyelid vertically above the medial limbus to a depth of 2cm, aiming tangentially away from the globe in the medial extra conal space and 3 ml of local anesthetic is given. Addition of hyaluronidase improves penetration of the local anesthetic drugs.

Fullness of the upper lid indicates an increase in the orbital volume and correct site of injection. Intermittent ocular compression is applied after the injection for 10 – 20 Minutes.

COMPLICATIONS OF PERIBULBAR BLOCK:

Chemosis

This is normally disappears completely in few minutes with the application of orbital compression.

Central retinal artery occlusion[12]

This can result from a retrobulbar hemorrhage and may result in total loss of vision, if not treated. If retrobulbar hemorrhage occurs, the patient's intraocular pressure and central retinal artery pulsations should be monitored. If external pressure on the globe is high enough to result in compression of the retinal arteries, then the surgeon should perform a deep lateral canthotomy or an anterior chamber paracentesis to decompress the orbit.

Globe perforation[13]

Globe perforation is diagnosed by sudden pain on injection, loss of vision, poor red reflex or vitreous haemorrage. There is a serious risk

of retinal haemorrage and detachment which may require laser retinopexy or vitrectomy.

Inadvertent brain stem anesthesia[14]

Accidental injection into the CSF can occur during the block due to perforation of the meningeal sheaths that surround the optic nerve. The patient may experience disorientation, amaurosis fugax, aphasia, hemiplegia, unconsciousness, convulsions, and respiratory or cardiac arrest a few minutes after the injection. Direct intravascular injection via the optic nerve sheath or local anesthesia carried by the ophthalmic and internal carotid artery by retrograde flow to the thalamus and midbrain can also present the same way. This situation requires prompt recognition and treatment (including airway control, respiratory support, possible cardiac intervention, etc.). Hence a patient should never be left unattended after the block.

Advantages of peribulbar block over retrobulbar block

1. Less chances of retrobulbar haemorrhage.
2. Lower incidence of perforation of eye or injury to the optic nerve.
3. The potential for intraocular or intradural injection is decreased, because the local anesthetic is deposited outside the muscle cone.

Disadvantages of peribulbar block

1. Akinesia of the extra-ocular muscles may be less complete.
2. Slower onset.
3. Greater volume of local anaesthetic required.
4. Greater incidence of periorbital ecchymosis & conjunctival chemosis.

Contraindications to peribulbar block

- Axial length >26mm: In severely myopic patients, the globe often has a long diameter. This increases the likelihood of globe perforation due to increased globe length and thinner sclera.
- Perforated eye or an open eye injury: The pressure from injecting fluid behind the eye may cause extrusion of intraocular contents through the wound.
- Infected eye.
- Patients with cardiovascular instability, COPD and skeletomuscular disorders (eg :rheumatoid arthritis and osteo arthritis) may be unable to lie flat and still.
- Patients taking anticoagulants: The dose should be adjusted to reduce the INR to <2.0.

PHARMACOLOGY OF LOCAL ANAESTHETIC DRUGS

Local anaesthetics are drugs which cause reversible loss of sensory perception, motor and autonomic blockade, in a restricted area of the body without causing any structural damage to neurons.

STRUCTURE OF LOCAL ANAESTHETIC DRUGS

Local aneasthetic drug consists of a hydrobhobic,[15] aromatic ring and a hydrophilic tertiary amine linked together by an intermediate bond, which is either an aminoamide or aminoester. The tertiary amine is a base, which is partially protonated, having some positive charge at physiologic pH.

CLASSIFICATION

Local anaesthetic drugs may be classified based on either its chemistry or potency and duration of action.

MODE OF ACTION

Hydrophilic local aneasthetic bases are poorly to sparingly soluble in water but are relatively soluble in organic solvents. Thus, most local aneasthetic drugs are available as hydrochloride salts.

At physiological pH, the local aneasthetic molecule is partially ionized. The equilibrium between the unionized base form[B] and the ionized cationic form [BH+] depends on the pKa of the local aneasthetic drugs. Only the unionized base form can penetrate the nerve fibre. Once inside the neuron; it gets reionized and acts on the Na+ channel from the inner side of the nerve fibre.

Local anaesthetic drugs block nerve conduction by decreasing the entry of Na+ ions during an action potential. The rate of rise of action potential and maximum depolarization decreases. Local depolarization falls to reach the threshold potential and conduction block results.

FACTORS AFFECTING CLINICAL PHARMACOLOGY OF LOCAL ANAESTHETIC AGENTS

Anaesthetic Potency

Hydrophobicity is the most important factor in determining anaesthetic potency. Drugs which are more hydrophobic are most potent and long acting than their less hydrophobic congeners.[16]

Onset Of Action

Drugs having their pKa close to the physiologic pH of 7.4 are faster acting, because a relatively higher percentage of drug is in the undissociated base form and it is this form which penetrates the axon.

The addition of bicarbonate to local anaesthetic solution accelerates the onset of block. Higher pH of the solution increases the amount of drug in unchanged base form, which enhances the rate of diffusion across the nerve sheath, resulting in more rapid onset.

Duration of action

Duration of anaesthesia is markedly influenced by peripheral vascular effects of local anaesthetic agents. Most drugs have a biphasic effect on vascular smooth muscle. At low concentrations they tend to

cause vasoconstriction, whereas at higher, clinically administered concentrations, they cause vasodilatation.

Addition of vasoconstrictor like adrenaline [1 in 200,000] prolongs the duration of action and reduces systemic toxicity by decreasing their rate of removal from the injection site.

Differential Blockade[17,18]

Local anaesthetic drugs, when used in lower concentration selectively block sensory fibres without causing motor blockade. The sensitivity is determined by diameter of fibres and fibre type. In general, smaller and non myelinated fibres are blocked more easily than larger C and myelinated fibres.

PHARMACOKINETICS: [19,20]

Absorption

The systemic absorption of drugs from the site of injection depends on the dose and volume of drugs, addition of vasoconstrictors, site of injection [absorption highest after intercostal block and least after subcutaneous injection] and individual characteristics like protein binding of local anaesthetic drugs. Amide local anaesthetic drugs are bound to α1 acid glycoprotein in plasma, whereas Ester local anaesthetic drugs have negligible protein binding activity.

Biotransformation and excretion

The aminoesters are hydrolysed in plasma by pseudocholinesterase enzymes, whereas, aminoamides are degraded in the liver microsomes by dealkylation and hydrolysis and the metabolites are excreted through the kidneys.

SYSTEMIC TOXICITY AND ADVERSE EFFECTS:

Cardio vascular system toxicity

Local anaesthetic drugs depresses myocardial automaticity and reduce duration of refractory period. At higher concentrations myocardial contractility and condution velocity are depressed. These effects are due to cardiac sodium channel blockade. Excessive dosage or accidental intravascular injection can cause bradycardia, heart block, hypotension, arrhythmias, circulatory collapse and cardiac arrest. Bupivacaine may induces severe cardiac arrhythmias including ventricular fibrillation in various animal species. These electrophysiologic effects of bupivacaine may result in conduction abnormalities, leading to reentrant type of arrhythmias. This is more common with bupivacaine and less with ropivacaine.

Central nervous system toxicity

Initial symptoms of CNS toxicity are circumoral numbness, tongue paresthesia, dizziness, disorientation, drowsiness, tinnitus and visual disturbances. Objective signs are initially excitatory in nature and include restlessness, tremors, twitching of muscles followed by convulsions, respiratory depression and death.

Local tissue toxicity

Use of vasoconstrictors enhance local tissue damage. Hence vasoconstrictors should not be used for digital blocks, pinna and penile block. Among local anaesthetics, bupivacaine has the highest local tissue toxicity.

Hypersensitivity reactions

Para amino benzoic acid, a metabolite of ester linked local anaesthetic drugs have been associated with allergic reaction like rashes, bronchial asthma and hypotension. Hypersensitivity reactions are rare with amide local anaesthetics. It may be due to methylparaben, which is used in commercial preparations of local anaesthetic solutions as a stabilizing agent.

PHARMACOLOGY OF BUPIVACAINE

Bupivacaine is an amide local anaesthetic, systhesized by A.F.Ekenstam in 1957 and brought into clinical use in 1963.

Structure of bupivacaine [21]

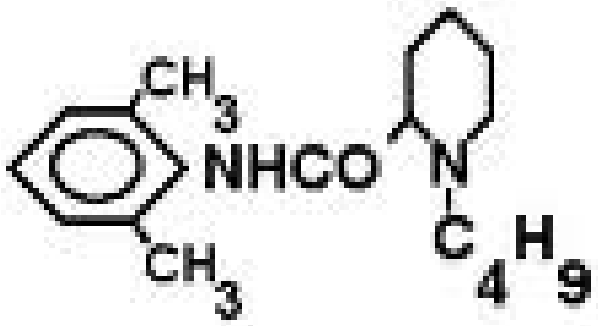
Formal chemical name (IUPAC)

1-butyl-N-(2,6-dimethylphenyl) piperidine-2-carboxamide

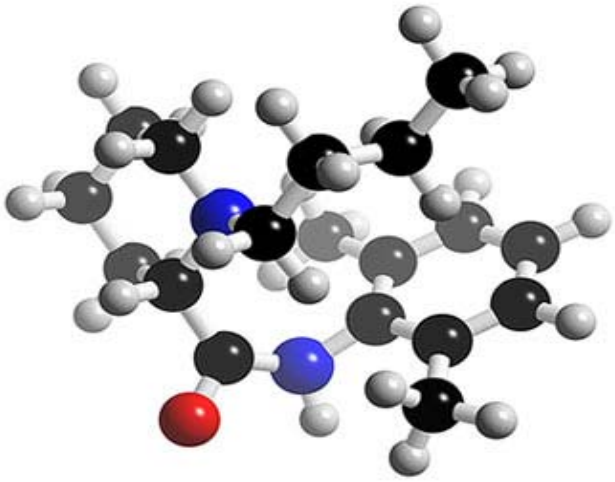
Chemical formula: $C_{18}H_{28}N_2O \cdot HCl \cdot H_2O$

It is produced for clinical use as a racemic mixture, containing equal proportion of the “S” and “R” enantiomers and supplied as hydrochloride salt.

STRUCTURE OF BUPIVACAINE



3DIMENSIONAL STRUCTURE OF BUPIVACAINE



Physicochemical profile

Molecular weight (base)	288
pKa	8.1
Octanol / Water partition coefficient	High
Lipid solubility	28
Plasma protein binding	95%

Pharmacodynamics

The clinical profile of nerve blockade produced by bupivacaine differs from that of lidocaine. The onset of action is slower and the duration of action is considerably longer. The sensory block produced by bupivacaine tends to be more marked than the motor block.

Pharmacokinetics

Bupivacaine is rapidly absorbed from the site of injection. The rate of rise in plasma bupivacaine concentration and the peak plasma concentration obtained depend on the route of administration. There is also some inter- individual variation and peak systemic concentration occurs between 5 and 30 minutes after administration. The addition of a vasoconstrictor delays absorption and result in lower plasma concentration of bupivacaine.

Pharmacokinetic Profile

Volume of distribution	73 litres
Clearance	0.47 l/min
t ½ α	2.7 min
t ½β	28 min
t ½γ	3.5 hrs

Metabolism

Possible pathways for metabolism of bupivacaine include aromatic hydroxylation, N-dealkylation, amide hydrolysis and conjugation. Only the N-dealkylated metabolite, N-desmethylbupivacaine has been measured in blood and urine after epidural and spinal administration. The degradation of bupivacaine takes place in the liver. Renal disease is unlikely to alter the kinetics of bupivacaine to any great extent. Less than 10% of the drug is excreted unchanged in urine.

The onset of action of bupivacaine occurs 20 -30 minutes after a peripheral nerve block and duration lasts for 8-9 hours.

Clinical Applications

- Infiltration anaesthesia
- Peripheral nerve blocks
- Central neuraxial blocks (intrathecal,epidural and caudal)

Preparations Available

0.5% bupivacaine solution in 20 ml vial with sodium chloride 8mg and methylparaben 1mg as preservative.

5mg/ml (0.5%) bupivacaine and 80 mg dextrose in 4 ml ampoules for intrathecal injection

Systemic toxicity

The ratio of the dosage required for irreversible cardiovascular collapse [CC] and the dosage that will produce CNS toxicity [CC /CNS ratio] is lower for bupivacaine than lidocaine.

The CC/CNS dose ratio for bupivacaine 3.7 ± 0.5.

Blood level ratio of CC/CNS for bupivacaine 1.6 ± 0.1.

Recommended Safe Dose: 2mg/kg

Toxic plasma concentration: >1.5 micro gram/ml.

Maximum single dose for infiltration in adults : 175mg.

PHARMACOLOGY OF ROPIVACAINE

Ropivacaine is a new aminoamide local anaesthetic. It is one of the group of local anaesthetic drugs, the pipecoloxylidides, which was brought into clinical use in 1992 .It is a single "S" enantiomer. It has an enantiometric purity of 99.5%.

Structure of Ropivacaine[22]

Formal Chemical Name (IUPAC)

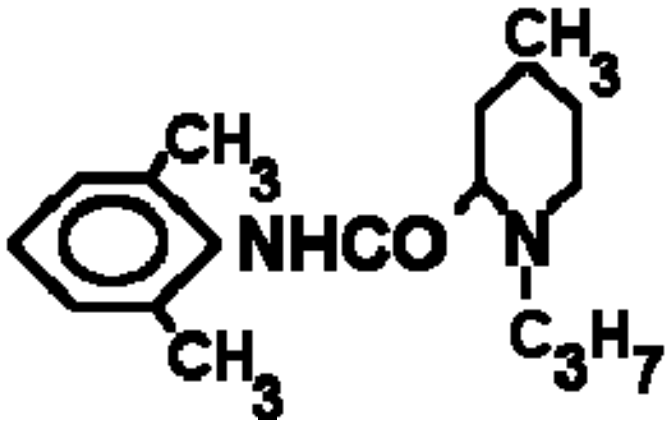
(S)-N-(2,6-dimethylphenyl)-1-propylpiperidine-2-carboxamide

Chemical formula: $C_{17}H_{26}N_2O_2 \cdot HCl \cdot H_2O$

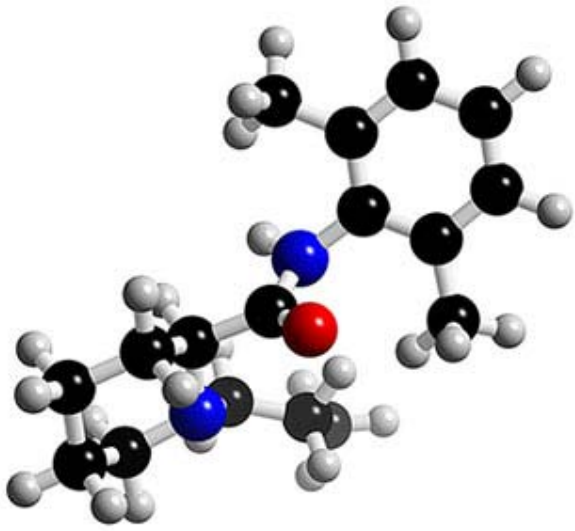
Physicochemical profile

Molecular weight (base)	274
pKa (25˚C)	**8.1**
Octanol / Water partition coefficient	**2.9**
Lipid solubility	**6.1**
Plasma protein binding	**94%**

STRUCTURE OF ROPIVACAINE



3 DIMENSIONAL STRUCTURE OF ROPIVACAINE



Pharmacokinetics [23]

Ropivacaine is 2-3 times less lipid soluble and has a smaller volume of distribution, greater clearance, and shorter elimination half-life than bupivacaine in humans. The two drugs have a similar pKa and plasma protein binding. Ropivacaine undergoes hepatic biotransformation and only a minor proportion is excreted unchanged in urine.

Pharmacokinetic Profile

Volume of distribution	59±7 litres
Clearance	0.82±0.16 l /min
Elimination half life	111± 62 min.

Metabolism

It is rapidly cleared from plasma and it is extensively metabolished by cytochrome P450 to 2',6'-pipecoloxylidide[PPX], 3'-OH ropivacaine and 4'-OH ropivacaine.

Clinical Applications [24]

- Infiltration anaesthesia
- Peripheral nerve blocks
- Central neuraxial blocks (intrathecal, epidural and caudal)

ADVANTAGES OF ROPIVACAINE OVER EXISTING LOCAL ANAESTHETIC AGENTS

The stereospecificity of s-ropivacaine decreases cardiotoxicity [25]

The bupivacaine and ropivacaine molecules both have chiral centers. Commercial bupivacaine is a 50:50 racemic mixture of the S- and R- enantiomers. Because of its greater affinity and dwell time at voltage-gated sodium channels, the R configuration confers greater cardiotoxicity to racemic bupivacaine. Compared to the S-enantiomer, R-bupivacaine binds three times more firmly to the sodium channel, and unbinds 4.4 times as slowly. R- bupivacaine is also more arrhythmogenic, and slows ventricular conduction 4.6 times as much as S-bupivacaine. Ropivacaine is manufactured as the pure S- enantiomer in order to take advantage of the decreased cardiotoxicity of the S- configuration.

Ropivacaine has a smaller direct negative inotropic and arrhythmogenic effect compared with bupivacaine. A study which measured the effect of bupivacaine and ropivacaine on multiple electrophysiologic parameters in isolated Purkinje fiber-ventricular muscle preparations found that bupivacaine produced greater depression of cardiac excitability and conduction.

Equivalent myocardial depression with ropivacaine was produced at concentrations twice that of bupivacaine. In addition, bupivacaine induced electrophysiological alterations which could make re-entrant type ventricular arrhythmias more likely. These findings were consistent with another study that examined the effect of ropivacaine and bupivacaine on isolated rabbit hearts. Similar myocardial depression with ropivacaine was produced at concentrations twice as great as bupivacine.

Bupivacaine produced more severe arrhythmias (AV block and ventricular arrhythmias) and more rapid onset of myocardial depression. In a live pig model in which local anesthetics were directly infused into the left anterior descending coronary artery, the electrophysiologic toxicity ratio of bupivacaine to ropivacaine (determined by the dose of drug required to produce prolongation of the QRS interval) was 6.7 : 15. These studies suggest that the direct myocardial toxicity of ropivacaine is about half that of bupivacaine.

Reduced CNS Toxicity[25]

Ropivacaine produces mild CNS effects (lightheadedness, tinnitus, tongue numbness) and is less likely to cause convulsions than bupivacaine. If convulsions occur, they are of shorter duration than produced by bupivacaine and resuscitation is almost always effective if started immediately This is not always seen with bupivacaine overdosage

Preparations available

1% Ropivacaine in 10 ml ampoule

0.75% Ropivacaine in 4, 10 and 20 ml ampoules.

0.5% Ropivacaine in 10 ml and 20 ml ampoule

Recommended Safe Dose: 3.5mg/kg

Toxic plasma concentration: >4 micro gram/ml.

Maximum single dose for infiltration in adults : 225mg.

PHARMACOLOGY OF LIDOCAINE

Lidocaine, the first amino amide-type local anesthetic, was first synthesized under the name Xylocaine by Swedish chemist Nils Löfgren in 1943. His colleague Bengt Lundqvist performed the first injection, experimenting on himself. It was first marketed in 1949. Lidocaine also has antiarrhythmic properties.

Structure of Lidocaine[19]

Formal Chemical Name (IUPAC)

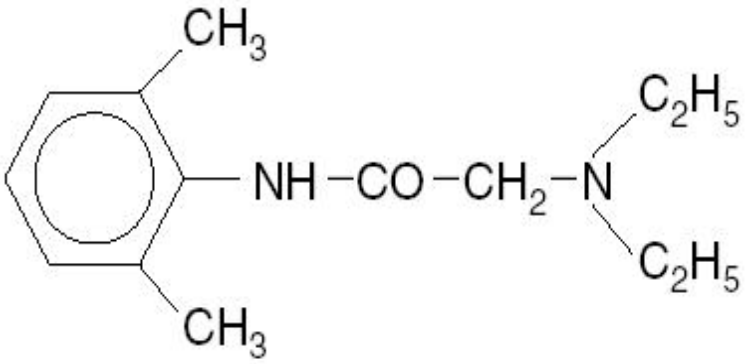
2-(Diethylamino)-N-(2,6-dimethylphenyl)-acetamide

Chemical formula: $C_{14}H_{22}N_2O$

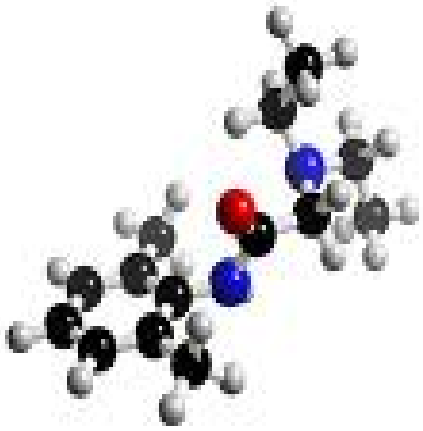
Physicochemical profile

Molecular weight (base)	234
pKa (25˚C)	7.9
Octanol / Water partition coefficient	Low
Lipid solubility	2.9
Plasma protein binding	64%

STRUCTURE OF LIDOCAINE



3 DIMENSIONAL STRUCTURE OF LIDOCAINE



Pharmacokinetics

Lidocaine is approximately 95% metabolized (dealkylated) in the liver by CYP3A4 to the pharmacologically-active metabolites mono ethyl glycine xylidide [MEGX] and then subsequently to the inactive glycine xylidide. MEGX has a longer half life than lidocaine but also is a less potent sodium channel blocker.

The elimination half-life of lidocaine is approximately 90–120 minutes.

Pharmacokinetic Profile

Volume of distribution	91 litres
Clearance	0.95 1/min
t ½ α	1.0min
t ½ β	9.6 min
t ½γ	1.6 hrs

Clinical Applications

- Infiltration anaesthesia
- Peripheral nerve blocks
- Central neuraxial blocks (intrathecal, epidural and caudal)
- Topical anaesthesia
- Intravenous regional anaesthesia

Indications

Lidocaine, when compared to bupivacaine, has a quicker onset of action and shorter duration of action. Lidocaine is also a Class 1B antiarrhythmic drug, used intravenously for the treatment of ventricular arrhythmias.

Preparations available

2% lidocaine (plain) - 30 ml vial – 2%lidocaine 20mg and sodium methylparaben 0.1% each ml.

2% lidocaine with adrenaline (adrenaline 1 in 2 lakhs) - 30ml vials.

5% lidocaine heavy (2ml ampoules) for spinal anaesthesia.

2% lidocaine without preservative (50ml vial) for intravenous use.

Recommended Safe Dose : 3 mg/kg without adrenaline.

7 mg/kg with adrenaline.

Toxic plasma concentration: >5 micro gram/ml.

Maximum single dose for infiltration in adults : 300mg without adrenaline.

REVIEW OF LITERATURE.

Luigi Gioia, MD*, Edi Prandi, MD*, Marco Codenotti, MD†, Andrea Casati, MD*, Guido Fanelli, MD*, Tiziana Monica Torri, BS*, Claudio Azzolini, MD†, and Giorgio Torri, MD [26] et al compared peribulbar anesthesia with either 0.75% ropivacaine or 2% lidocaine and 0.5% bupivacaine mixture for vitreoretinal surgery. They demonstated that 0.75% ropivacaine has an onset similar to that of the 2% lidocaine and 0.5% bupivacaine mixture and provides a better quality of post operative analgesia.

Huha T, Ala-Kokko TI, Salomaki T, Alahuhta S [27] et al compared the clinical efficacy and pharmacokinetics of 1% ropivacaine and 0.75% bupivacaine in peribulbar anaesthesia for cataract surgery. They compared akinesia of the globe after injection of the local anaesthetic. Lid akinesia was significantly more complete in the ropivacaine group. There were no differences between the groups with respect to peri-operative analgesia or duration of akinesia. They demonstrated no clinically significant differences in the quality of the sensory and motor block between 1% ropivacaine and 0.75% bupivacaine when used for peribulbar anaesthesia.

Perello A, George J, Skelton V, Pateman J [28] et al compared ropivacaine 0.5% , bupivacaine 0.375% - lidocaine 1% and ropivacaine 0.5% - lidocaine 1% mixtures for cataract surgery. They concluded that there was a slower onset of akinesia in using ropivacaine alone.

D. K. Woodward, A. T. S. Leung, [29] et al studied peribulbar anaesthesia with 1% ropivacaine and hyaluronidase 300 IU ml^{-1}. In comparison with 0.5%bupivacaine,2% lidocaine and hyaluronidase 50 IU ml^{-1} . They showed no difference in the rate of onset and degree of akinesia achieved.

Gillart T, Barrau P, Bazin JE, Roche G, Chiambaretta F, Schoeffler P [30] et al study was compared the effects of ropivacaine and bupivacaine, each combined with lidocaine, during peribulbar anesthesia by single medial injection for cataract surgery. They concluded that lidocaine with ropivacaine produces better anaesthesia and similar analgesia when compared to lidocaine with bupivacaine.

Mehmet Borazan, Aylin Karalezli, Sibel Oto, Cengiz Algan and Yonca Aydin Akova [31] et al compared bupivacaine 0.5% and lidocaine 2% mixture with levobupivacaine 0.75% and ropivacaine 1% in peribulbar anaesthesia for cataract surgery with phacoemulsification.

They concluded there was no significant difference between the groups regarding duration of sensory and motor blockade and surgical analgesia.

Nociti JR, Serzedo PS, Zuccolotto EB, Cagnolati CA, Nunes AM [32]et al compared 1% ropivacaine with 0.75% bupivacaine in peribulbar block and noted that there was a faster onset of peibulbar block with ropivacaine.

Luchetti M, Magni G, Marraro G[33] et al conducted a prospective, randomized, double- blinded study of ropivacaine 0.75% versus bupivacaine 0.5% and mepivacaine 2% for peribulbar anesthesia.

Corke PJ, Baker J, Cammack R,[34] et al compared 1% ropivacaine and mixture of 2% lignocaine and 0.5% bupivacaine for peribulbar anaesthesia in cataract surgery. They concluded that both the groups had excellent surgical analgesia and akinesia

Didonato A [35]et al compared efficacy of 0.5% levobupivacaine with 0.75% ropivacaine for peribulbar anaesthesia in cataract surgery. 0.5% levobupivacaine showed early onset of sensory and motor blockade and better akinesia score than 0.75 % ropivacaine.

Olmez cakmak [36]et al compared the effects of 0.75% ropivacaine with those of 2% lidocaine on quality of the blockade in peribulbar block

for cataract surgery. They concluded that duration of the motor block obtained with ropivacaine was longer.

L. Trivedi, H. Trivedi, D. Tripathi, P. Jha, K. Bhalani & P. Raval [37] et al conducted a study to evaluate the efficacy of ropivacaine 0.75% with hyaluronidase 50 IU/ml and to compare the quality of block with bupivacaine 0.5% with hyaluronidase 50 IU/ml They demonstrated ropivacaine has better hemodynamic profile with greater reduction in IOP as compared to bupivacaine.

Jetzy Jaworski [38]et al studied 1% ropivacaine versus 2% lidocaine with 0.5% bupivacaine and 2% lidocaine with 1% ropivacaine. They concluded that the onset of akinesia and post operative pain relief were similar in all groups.

MATERIALS AND METHODS

This is a prospective, randomized, double blinded study conducted between July and September 2010, at Chengalpattu Medical College Hospital, after getting approval from the ethical committee.

Our study group had a total of 60 patients who underwent small incision cataract surgery during this period.

An anaesthesia consultant randomized the patient groups on the day of surgery from the ophthalmic list into group R and group B by draw of lots. The same anaesthesia consultant also drew up 8ml of either control or study drug using sterile precautions and coded them.

An anaesthsia resident who was blinded to this study was given the coded syringes by the anaesthsia consultant and was asked to perform the peribulbar block.

Another resident [myself] collected the data as per proforma.

Inclusion criteria

Patients belonging to ASA grade I and grade II

Exclusion criteria

- Local sepsis
- Glaucoma
- Serious impairment of coagulation
- Orbital abnormalities
- Patients refusal
- Un-cooperative patients
- Patients unable to lie supine for long.

Study groups – Group R and Group B

Group R coded syringe contains 8ml of 1:1 mixture of 2% lidocaine, 0.75% ropivacaine and 15 IU/ml of hyaluronidase.

Group B coded syringe contains 8ml of 1:1 mixture of 2% lidocaine, 0. 5% bubivacaine and 15 IU/ml of hyaluronidase.

All patients were thoroughly examined preoperatively in the assessment room. Basic parameters like pulse rate, blood pressure, respiratory rate and baseline investigations like hemoglobin, urine analysis for albumin and sugar, blood sugar, urea and creatinine and ECG were checked.

In the operation room, appropriate equipments for airway management and emergency drugs were kept ready.

An initial preoperative counselling and reassurance to gain confidence of the patients was done. Informed consent was obtained and procedure was explained in patient's vernacular language. Visual analog scale (VAS) score was explained to all the patients.

Patients were advised nil per oral for 6 hours before the procedure. All patients were premedicated with Tab. Diazepam 5 mg orally, 2 hours before the surgery.

Patients were shifted to the operating room on a stretcher and placed on operating table in supine position. Noninvasive blood pressure, oxygen saturation and ECG of all the patients were monitored. Preoperative baseline systolic and diastolic blood pressure, pulse rate, respiratory rate and oxygen saturation were recorded. Patients were cannulated with 18G intravenous cannula in nondominant hand. One drop

of 4% lidocaine was administered topically on the day of operation to measure baseline intraocular pressure with Schiotz tonometer.

Peribulbar block was performed as per Bloomberg's [9] modification of the Davis and Mandel technique.

Patients were asked to maintain the eye in the primary gaze directly ahead. A 22G , 25mm needle was inserted in the inferotemporal region through the skin, at the junction of medial 2/3rd and lateral 1/3rd of the lower orbital margin. Once the needle was under the globe, it was directed along the orbital floor up to the depth of the mid-orbit in the lateral extra conal space and not in an upward and inward direction to avoid injury to optic nerve. After careful negative aspiration, 5 ml of local anesthetic was given.

The second injection was given in the supero-nasal area by inserting the same needle through the upper eyelid vertically above the medial limbus to a depth of 2cm, aiming tangentially away from the globe in the medial extra conal space and 3 ml of local anesthetic was given. Manual compression and gentle massage of the eyeball were performed to facilitate spread of anaesthetic solution.

Patients were assessed for sensory block, eyelid and ocular movements at 2 minutes intervals. Systolic, diastolic and mean arterial pressures, heart rate & oxygen saturation were monitored non invasively at 1,3,5,8,10,15 and then every 10 minutes till the end of the surgery.

Sensory block

Sensory block was evaluated by loss of sensation of the cornea with cotton. This assessment was started 2,4,6,8 &10 minutes after injection. Onset of sensory block was taken as the time from injection to loss of corneal sensation.

Motor block.

Ocular globe motility was evaluated in the four quadrants using a 3-point scoring system:

0 - Akinesia (ocular movement <1 mm),

1 - Reduced movement (ocular movement >1 mm but < 4 mm),

2 - Normal movement (ocular movement >4 mm).

This scoring system gives a maximal aggregate score of 8 for the four muscles. A score of ≤ 2, reduced movements in all directions, was taken to indicate successful block. Once successful block had been achieved, no further assessments were made.

Quality of surgical anaesthesia:

Surgical anaesthesia was graded as

- Excellent - No pain at any time during surgery.
- Good - Minimal pain or discomfort.
- Poor - Failed block leading to conversion to general anaesthesia.

Intraoperatively, oxygen 4 litres/min was administered via the nasal cannula to all the patients under sterile drapes.

Assessment of pain

Patients were shifted to post anaesthesia care unit after completion of surgery. Vital signs were recorded every 15 minutes in the first hour after surgery, every 30 minutes for the next 2 hours and thereafter, every hour for the next 3 hours.

Pain assessment using VAS was done every 15 minutes till VAS score ≥ 3 was reached . Once this score was reached, patients were given Tab. Ibuprofen 400mg and Tab. Paracetamol 500mg orally as rescue analgesia.

Duration of effective analgesia was defined as time interval between peribulbar block and the time to reach VAS Score ≥ 3.

Resolution of motor blockade could not be assessed, as patient's eyes were bandaged and covered after the operation.

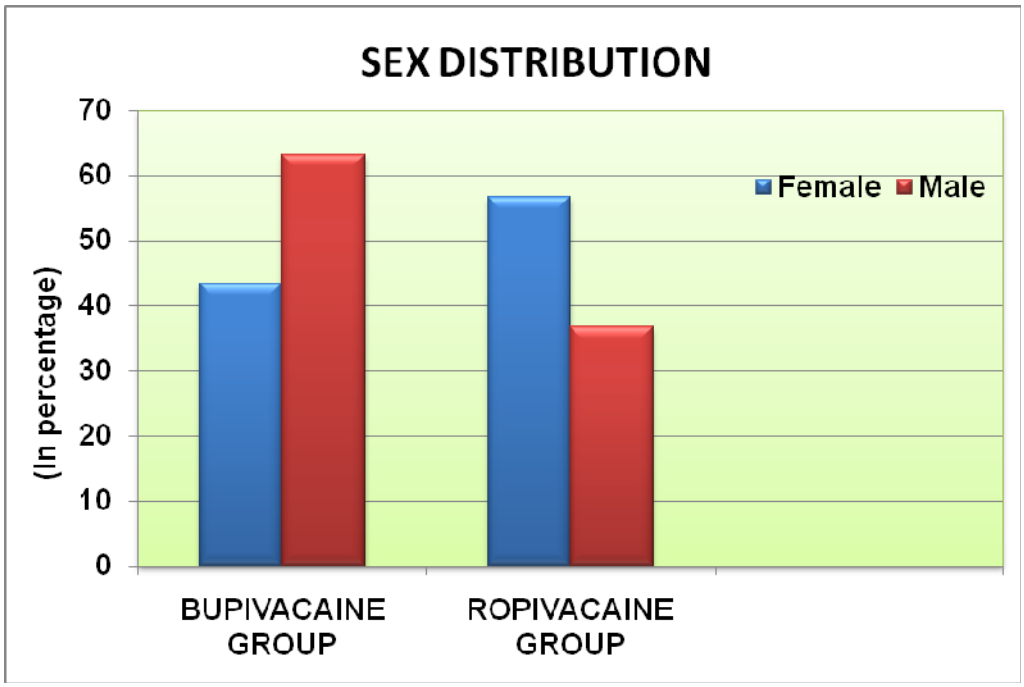
OBSERVATION AND RESULTS

Methods

The data collected were subjected to statistical analysis. Continuous variables are presented as mean ± SD, ordinal and nominal data are presented as number and percentage. Comparison between these groups were made using Student's t test for quantitative data and Pearson's chi square (X^2)test for qualitative data.

The Patients characteristics such as Age, Height, and Weight were analyzed by using Student's t test. The sex of the patient was analyzed by using contingency table analysis with Pearson's chi square (X^2) test.

Onset of sensory block, onset of motor block (minutes) and duration of analgesia among Group(B) and Group(R) were analyzed using Student's t tests. **P value of <0.05 was considered as significant.**


SEX DISTRIBUTION
70
60
50
40
30
20
10
0
(In percentage)
Female
Male
BUPIVACAINE GROUP
ROPIVACAINE GROUP

Demographic characteristics of the study subjects

Sex distribution.

2% Lidocaine and 0.5% Bupivacaine – Group - B

Sex	Frequency	Percent
Female	13	43.3
Male	17	56.7

2% Lidocaine and 0.75% Ropivacaine – Group – R

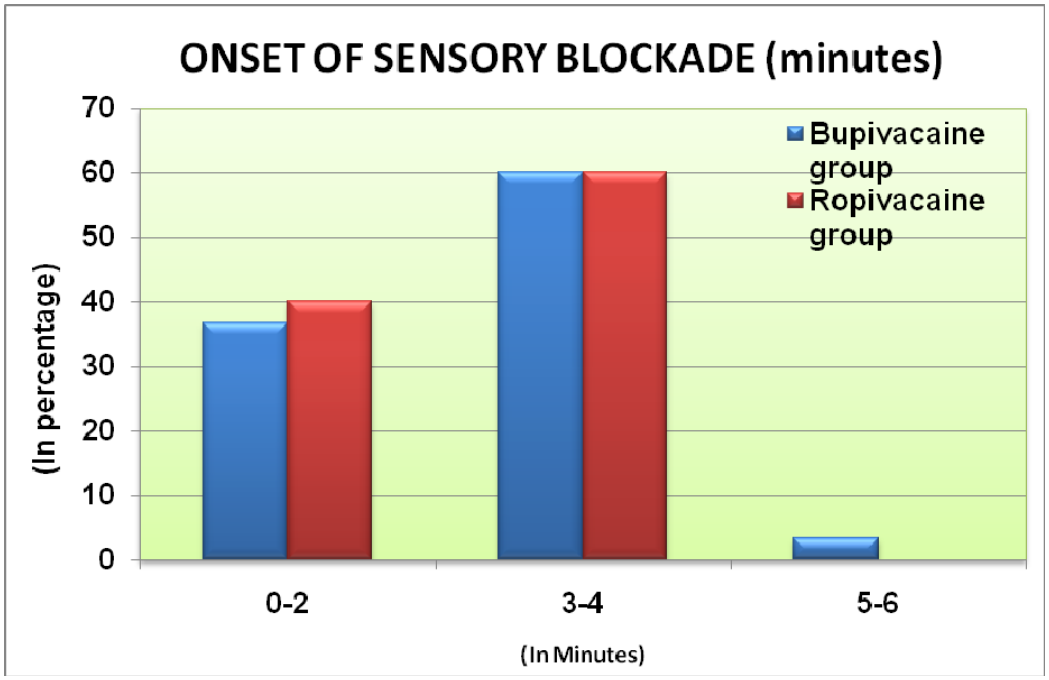
Sex	Frequency	Percent
Female	19	63.3
Male	11	36.7

Patients Characteristics

Patient Characteristics	GROUP - B	GROUP - R	P value
Age (years)*	55.57 ± 5.75	56.23 ± 5.61	0.651
Sex (Male/Female)	17/13	11/19	0.196
Weight*(kgs)	59.03 ± 3.60	57.46 ± 4.30	0.131

* values are expressed as mean ± S.D

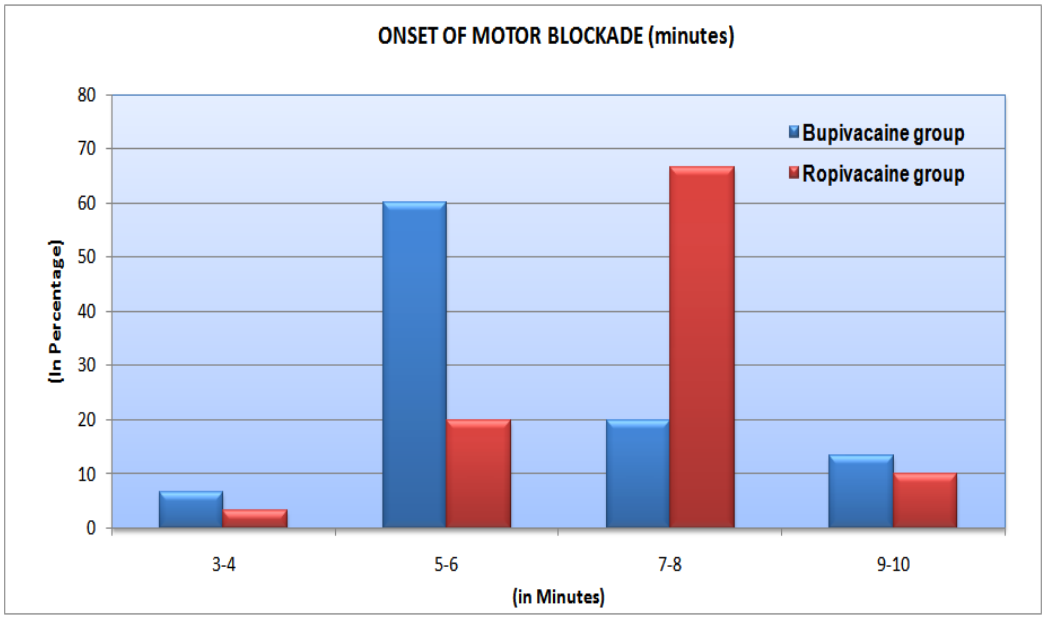
There was **no significant difference** between both the study groups with regard to age, sex and weight. Patient's characteristics were similar and comparable between the two study groups.


ONSET OF SENSORY BLOCKADE (minutes)
70
60
50
40
30
20
10
0
(In percentage)
Bupivacaine group
Ropivacaine group
0-2
3-4
5-6
(In Minutes)

ONSET OF SENSORY BLOCKADE (in minutes)

Time (in minutes)	GROUP - B		GROUP - R	
	Frequency	**Percent**	**Frequency**	**Percent**
0-2	11	36.7	12	40.0
3-4	18	60.0	18	60.0
5-6	1	3.3	0	0.0

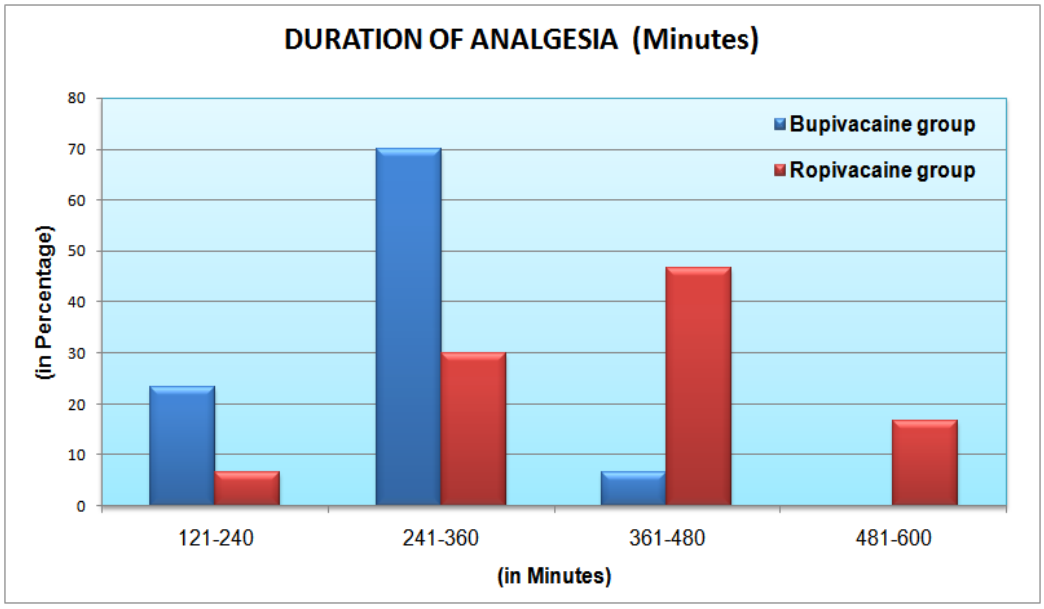
Since the p value was >0.05, there was **no significant difference** in the onset of sensory block between the study groups.


ONSET OF MOTOR BLOCKADE (minutes)
80
70
60
50
40
30
20
10
0
(In Percentage)
Bupivacaine group
Ropivacaine group
3-4
5-6
7-8
9-10
(in Minutes)

ONSET OF MOTOR BLOCKADE (in minutes)

Time (in minutes)	GROUP- B		GROUP - R	
	Frequency	Percent	Frequency	Percent
3-4	2	6.7	1	3.3
5-6	18	60.0	6	20.0
7-8	6	20.0	20	66.7
9-10	4	13.3	3	10.0

Since the p value was <0.05, there was a **statistically significant difference** in the onset of motor blockade among group B and group R, showing bupivacaine has a rapid onset of motor blockade when compared with ropivacaine.


DURATION OF ANALGESIA (Minutes)
80
70
60
50
40
30
20
10
0
(in Percentage)
Bupivacaine group
Ropivacaine group
121-240
241-360
361-480
481-600
(in Minutes)

DURATION OF ANALGESIA (in Minutes)

Time (in minutes)	GROUP - B		GROUP - R	
	Frequency	Percent	Frequency	Percent
121-240	7	23.3	2	6.7
241-360	21	70.0	9	30.0
361-480	2	6.7	14	46.6
481-600	0	0.0	5	16.7

Since the p value was <0.05 , there was a **statistically significant difference** in the duration of analgesia among group B and group R, showing ropivacaine has a longer duration of analgesia when compared with bupivacaine.

DESCRIPTION	GROUP - B	GROUP - R	P value
ONSET OF SENSORY BLOCK (in minutes)	2.70 $\pm$ .65	2.63 $\pm$ .57	0.671
ONSET OF MOTOR BLOCK (in minutes)	6.53 $\pm$ 1.81	7.57 $\pm$ 1.46	0.018
DURATION OF ANALGESIA (in minutes)	295.00 $\pm$ 54.63	414.67 $\pm$ 99.47	0.001

From the statistical analysis there was **no statistically significant difference** between the two study groups with regard to age, sex and weight.

Mean time [SD] for the onset of sensory blockade was 2.70 ± 6.5minutes in Group B and 2.63 ± 0.57minutes in group R. Since the p value was 0.671, there was **no significant difference** in the onset of sensory blockade between both groups.

Mean time [SD] for the onset of motor blockade was 6.53 ± 1.81 minutes in group B, and 7.57 ± 1.46 minutes in the group R.

Mean time [SD] for the duration of analgesia lasted for 295 ± 54.63 minutes in group B and 414.67 ± 99.47 in group R. The p value for the onset of motor blockade and duration of analgesia were 0.018 and 0.001 respectively. Since the p value was <0.05, there was a **statistically significant difference** among both the groups, with regard to onset of motor blockade and duration of analgesia.

DISCUSSION

The use of regional anesthesia for ophthalmic surgery is popular because it is associated with fewer respiratory and hemodynamic untoward events when compared to general anesthesia. Moreover, postoperative pain relief and the incidence of nausea and vomiting are less with regional anesthesia

The use of retrobulbar anesthesia is associated with rare, but severe complications such as ocular perforation, direct optic nerve injury, extraocular muscle paresis, severe retrobulbar hemorrhage, retinal vascular occlusion, contralateral amaurosis, and systemic local anesthetic toxicity. To reduce the morbidity associated with retrobulbar anesthesia, Davis and Mandel developed peribulbar block, which seems to be associated with fewer complications than retrobulbar anesthesia . For this reason, peribulbar anesthesia is now considered a safe and effective technique for cataract surgery.

Bupivacaine alone might seem more appropriate as a control drug than the lidocaine-bupivacaine mixture; however the protocol of the Ophthalmology department of our institution is to use lidocaine-

bupivacaine mixture for peribulbar block, combining lidocaine's faster onset time and bupivacaine's longer postoperative pain relief.

This study was done in our institution, where we use a mixture of lidocaine, bupivacaine and hyaluronidase. The aim of our present study is to find out the usefulness of ropivacaine, a newer local anaesthetic, which is considered to have a longer duration of action and lesser toxicity.

On statistical analysis of the data obtained from the group of 60 patients with similar demographic profile, we found that there was no statistically significant difference between the group R and group B with regard to onset of sensory blockade. This corresponds to study done by Huha T et al[27], who concluded that there were no clinically significant differences in the sensory blockade between 1% ropivacaine and 0.75% bupivacaine in peribulbar anaesthesia for cataract surgery.

Regarding the onset of motor blockade, Group B had a statistically significant rapid onset of motor blockade when compared to Group R. This corresponds to study done by Perello A et al[28], who concluded that there was a slower onset of akinesia in using ropivacaine alone. This could have been due to better motor blockade produced by 0.5% bupivacaine when compared to 0.75% ropivacaine, which produces more

of sensory blockade. But the limitation in our study regarding the onset of motor blockade is the addition of 2% lidocaine to the local anaesthetic mixture, which is the protocol of our ophthalmology department.

Regarding the duration of analgesia, our study showed highly statistically significant prolongation of duration of analgesia with group R, which corresponds to the study done by Luigi Gioia et al[26], who compared 0.75% ropivacaine with a mixture of 2% lidocaine and 0.5% bupivacaine, and demonstrated that ropivacaine has an onset similar to that of the lidocaine-bupivacaine mixture and provides a prolonged duration of postoperative analgesia.

From our study we found that the total duration of sensory blockade, which the patients benefits as an effective postoperative analgesia, is statistically significant, proving the efficacy of 0.75% ropivacaine, a newer local anaesthetic in peribulbar block.

CONCLUSION

We conclude from our study that Inj. 0.75% Ropivacaine given for peribulbar block is a better and safer choice of local anaesthetic to prolong the postoperative pain relief when compared to Inj. 0.5% Bupivacaine.

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PROFORMA

COMPARISION OF 1:1 MIXTURE OF 2% LIDOCAINE AND 0.5% BUPIVACAINE WITH 2% LIDOCAINE AND 0.75% ROPIVACAINE

NAME : IP NO:

AGE / SEX :

WEIGHT:

DIAGNOSIS: SURGERY:

PREOP ASSESSMENT:

PULSE RATE : CVS:

BLOOD PRESSUE: RS:

TEMP : CNS:

SPO2: ABD:

AIRWAY:

TEETH: MPC: I /II / III /IV TMD:

MOUTH OPENING

ASA GRADING : I / II

INVESTIGATION:

Hb%	PCV	BT	CT	ECG	CXR	RFT

PREMEDICATION: Tab. Diazepam 5mg orally 2 hours before surgery.

MONITORING: NIBP , HR , ECG , SPO2.

GROUP R : 1:1 MIXTURE OF 2% LIDOCAINE AND 0.75% ROPIVACAINE.

GROUP B : 1:1 MIXTURE OF 2% LIDOCAINE AND 0.5% BUPIVACAINE.

ONSET OF THE SENSORY BLOCKADE [IN MINUTES]:

ONSET OF THE MOTOR BLOCKADE [IN MINUTES]:

3 POINT SCORING SYSTEM.

OCULAR GLOBE MOTILITY

0 - AKINESIA

1 – REDUCED MOVEMENT

2 – NORMAL MOVEMENT

QUALITIY OF BLOCK FOR SURGERY AFTER 10 MINUTES

SATISFACTORY BLOCK

UNSATISFACTORY BLOCK

COMPLETE FAILURE

DURATION OF SENSORY BLOCKADE [IN MINUTES]:

OBSERVATION

INTRA OPERATIVE PERIOD

Time (min)	1	3	5	8	10	15	20	25	30	35	40	50	60	75	90	105	120
Onset of the Sensory blockade																	
Onset of Motor blockade																	
Quality of blockade																	
H R																	
SpO2																	
B P																	
ECG																	
VAS																	

POST OPERATIVE PERIOD 12 HOURS

Time (min)	150	180	210	240	270	300	360	420	480	540	600	660	720
Complaints of pain													
HR													
SPO2													
BP													
ECG													
VAS													

MASTER CHART OF GROUP R – PATIENTS RECEIVING
1:1 MIXTURE OF 2% LIDOCAINE AND 0.75 % ROPIVACAINE

SL NO	NAME	IP NO	AGE	SEX	Wt in kg	ONSET OF SENSORY BLOCKADE [min]						ONSET OF MOTOR BLOCKADE [min]						TOTAL DURATION OF ANALGESIA [min]					
						min	1	2	3	5	7	min	4	5	6	8	10	min	0-120	121-240	241-360	361-480	481-600
1	Ranganayaki	30494	60	F	60	3			√			10					2/8	360			√		
2	Anjalai	30400	52	F	70	3			√			8				2/8		420				√	
3	Kasiammal	31617	50	F	56	2		√				8				2/8		420				√	
4	Muniammal	31473	50	F	56	2		√				5		2/8				300			√		
5	Saroja	31461	60	F	58	3			√			8				2/8		270			√		
6	Suseela	30476	48	F	55	2		√				10					2/8	420				√	
7	Rajammal	30409	55	F	58	3			√			6			2/8			360			√		
8	Navanetham	30761	60	F	58	3			√			8				2/8		480				√	
9	Dhanakodi	32081	60	F	64	3			√			8				2/8		360			√		
10	Nagammal	32229	60	F	59	2		√				8				2/8		420				√	
11	Balammal	32053	57	F	65	3			√			8				2/8		560					√
12	Mariammal	31603	59	F	58	3			√			10					2/8	360			√		
13	Indirani	32079	59	F	54	2		√				6			2/8			600					√
14	Kaliammal	32456	59	F	52	3			√			8				2/8		420				√	
15	Deivanai	30408	59	F	52	3			√			5		2/8				480				√	
16	Panchalai	32901	59	F	55	3			√			8				2/8		420				√	
17	Ganapathy	31625	57	M	58	2		√				8				2/8		540					√
18	Babu	30482	58	M	52	2		√				8				2/8		480				√	
19	Manikkam	31498	60	M	54	3			√			8				2/8		240		√			
20	Durai	31483	58	M	52	2		√				8				2/8		270			√		
21	Mani	31203	48	M	58	2		√				8				2/8		180		√			
22	Dhanikachalam	34026	58	M	56	3			√			8				2/8		480				√	
23	Ragavan	33749	58	M	58	2		√				6			2/8			360			√		
24	Duraikannu	32891	58	M	58	3			√			5		2/8				480				√	
25	Ganesan	32888	60	M	62	3			√			8				2/8		540					√
26	Ravi	29515	45	M	54	4				√		8				2/8		420				√	
27	Rani	29482	40	F	52	2		√				4	2/8					420				√	
28	Indirani	33751	50	F	58	3			√			8				2/8		360			√		
29	Jayalakmi	34055	55	F	58	3			√			8				2/8		480					√
30	Sundaravarathan	31194	60	M	64	2		√				8				2/8		540					√

MASTER CHART OF GROUP R – PATIENTS RECEIVING
1:1 MIXTURE OF 2% LIDOCAINE AND 0.75 % ROPIVACAINE

SL NO	NAME	IP NO	AGE	SEX	Wt in kg	HEART RATE (min)														VISUAL ANALOG SCORE (VAS)												
						0	5	10	15	30	60	120	180	240	300	360	420	480	540	600	0	5	10	15	30	60	120	180	240	300	360	420	480	540	600
1	Ranganayaki	30494	60	F	60	90	96	80	86	85	84	86	84	88	90	106	106	96	98	90	0	0	1	1	1	1	0	2	2	2	3				
2	Anjalai	30400	52	F	70	76	72	74	76	77	79	79	80	82	84	84	98	106	98	96	0	0	0	0	0	1	1	2	2	2	2	3			
3	Kasiammal	31617	50	F	56	88	88	84	83	82	88	86	84	86	88	96	105	96	98	88	0	0	0	0	1	1	1	1	2	2	2	3			
4	Muniammal	31473	50	F	56	86	86	88	88	86	85	86	86	96	108	96	98	88	87	86	0	0	0	1	1	1	2	2	2	3					
5	Saroja	31461	60	F	58	86	88	87	89	84	82	88	88	98	102	98	96	88	87	87	0	0	2	1	1	1	2	2	2	3					
6	Suseela	30476	48	F	55	88	88	86	88	88	88	86	84	86	96	98	108	96	98	88	0	0	0	0	0	1	1	1	2	2	2	3			
7	Rajammal	30409	55	F	58	78	74	86	78	76	78	78	76	86	96	106	98	96	88	88	0	0	0	1	1	1	2	2	2	2	3				
8	Navanetham	30761	60	F	58	86	84	84	82	88	84	86	88	88	88	86	96	106	98	96	0	0	0	1	1	1	1	1	2	2	2	2	3		
9	Dhanakodi	32081	60	F	64	88	88	88	88	86	88	88	86	84	90	98	94	88	86	84	0	0	1	1	1	1	0	2	2	2	3				
10	Nagammal	32229	60	F	59	86	88	88	86	88	76	76	86	86	86	96	106	96	98	96	0	0	0	0	1	1	1	2	2	2	2	3			
11	Balammal	32053	57	F	65	88	86	86	76	78	88	86	86	86	86	88	86	96	98	96	0	0	0	0	0	1	1	1	2	2	2	2	2	3	
12	Mariammal	31603	59	F	58	86	78	78	76	78	86	78	86	86	98	106	98	96	88	88	0	0	0	1	1	1	1	1	2	2	3				
13	Indirani	32079	59	F	54	88	88	88	86	96	88	88	86	86	88	88	96	98	96	106	0	0	0	0	0	0	1	1	1	1	1	2	2	2	3
14	Kaliammal	32456	59	F	52	88	86	86	88	76	82	86	88	86	84	96	104	92	96	88	0	0	0	0	0	0	1	1	2	2	2	3			
15	Deivanai	30408	59	F	52	88	87	86	82	80	76	78	84	88	92	92	96	110	96	90	0	0	0	1	1	1	1	1	2	2	2	2	3		
16	Panchalai	32901	59	F	55	88	86	88	82	86	76	78	78	76	82	96	106	90	88	86	0	0	0	0	0	1	1	1	2	2	2	3			
17	Ganapathy	31625	57	M	58	88	84	80	86	76	84	86	86	84	80	78	86	96	106	96	0	0	0	0	1	1	1	1	2	2	2	2	2	3	
18	Babu	30482	58	M	52	78	78	80	86	86	76	76	86	78	76	86	88	98	88	86	0	0	0	0	1	1	1	1	2	3	2	2	3		
19	Manikkam	31498	60	M	54	88	84	78	80	74	88	76	76	102	88	86	88	86	84	82	0	0	0	0	0	2	2	2	3						
20	Durai	31483	58	M	52	88	88	84	86	74	86	88	86	94	108	96	88	88	86	88	0	0	0	1	1	1	1	2	2	3					
21	Mani	31203	48	M	58	88	84	78	76	78	86	88	106	96	86	88	88	86	88	76	0	0	1	1	2	2	2	3							
22	Dhanikachalam	34026	58	M	56	58	60	62	68	58	56	66	64	64	58	66	68	88	76	68	0	0	0	0	1	1	1	1	2	2	2	2	3		
23	Ragavan	33749	58	M	58	86	86	78	76	78	78	88	86	84	90	106	88	86	84	82	0	0	0	0	1	1	1	2	2	2	2	3			
24	Duraikannu	32891	58	M	58	76	78	76	78	78	74	74	88	84	88	90	90	104	88	88	0	0	0	0	1	1	1	1	1	2	3	2	2	3	
25	Ganesan	32888	60	M	62	88	88	88	86	88	86	82	88	86	84	82	90	94	108	90	0	0	0	0	0	0	1	1	1	1	2	2	2	2	3
26	Ravi	29515	45	M	54	88	88	88	86	88	80	78	86	86	86	90	110	96	88	86	0	0	0	0	0	1	1	1	2	2	2	2	3		
27	Rani	29482	40	F	52	96	94	98	80	84	86	96	86	90	96	96	112	96	92	98	0	0	0	0	0	1	1	1	1	1	2	2	3	2	3
28	Indirani	33751	50	F	58	88	86	86	88	86	74	88	86	88	90	104	86	88	86	88	0	0	0	1	1	1	1	2	2	2	3				
29	Jayalakmi	34055	55	F	58	78	74	76	78	76	72	78	78	82	78	80	86	96	86	88	0	0	0	0	0	1	1	1	2	2	2	2	3		
30	Sundaravarathan	31194	60	M	64	88	88	88	76	76	80	86	86	86	90	96	88	96	106	88	0	0	0	1	1	1	1	1	2	2	2	2	2	3	

MASTER CHART OF GROUP R – PATIENTS RECEIVING
1:1 MIXTURE OF 2% LIDOCAINE AND 0.75 % ROPIVACAINE

SL NO	NAME	IP NO	AGE	SEX	Wt in kg	Blood Pressure (mm of Hg)														
						0	5	10	15	30	60	120	180	240	300	360	420	480	540	600
1	Ranganayaki	30494	60	F	60	120/80	136/96	120/86	120/80	126/70	120/80	120/80	120/80	126/70	130/80	160/96	130/86	136/96	138/80	130/80
2	Anjalai	30400	52	F	70	110/70	120/80	110/76	110/76	126/70	126/70	120/80	120/80	120/82	120/82	136/86	150/102	120/80	120/80	120/80
3	Kasiammal	31617	50	F	56	120/80	136/96	120/86	120/80	126/70	126/70	120/80	120/80	126/70	130/80	136/86	160/96	136/96	138/80	130/80
4	Muniammal	31473	50	F	56	120/80	120/80	126/70	126/70	120/80	126/70	130/80	130/80	136/96	156/106	140/96	140/96	120/80	120/80	120/86
5	Saroja	31461	60	F	58	130/80	126/70	126/70	127/80	126/70	126/70	120/80	130/80	140/96	146/96	146/96	136/86	130/90	130/86	130/88
6	Suseela	30476	48	F	55	120/80	126/86	136/86	120/80	124/74	126/76	120/70	130/80	128/86	130/80	136/88	140/96	130/90	120/80	120/76
7	Rajammal	30409	55	F	58	120/80	110/70	120/70	110/80	120/80	120/70	130/80	130/80	136/86	136/86	165/96	145-96	130/80	130/80	130/80
8	Navanetham	30761	60	F	58	130/80	130/80	120/80	120/80	130/80	130/80	130/80	130/80	120/80	120/80	120/80	126/86	146/96	136/96	130/90
9	Dhanakodi	32081	60	F	64	130/80	120/80	110/80	130/80	120/80	127/74	120/70	130/80	120/80	136/86	146/86	146/96	140/80	120/76	120/76
10	Nagammal	32229	60	F	59	120/80	130/80	124/76	120/76	110/70	130/80	130/80	130/80	120/80	120/80	126/86	160/106	150/96	130/86	130/80
11	Balammal	32053	57	F	65	140/80	120/80	120/80	136/86	130/80	120/80	120/76	130/80	120/80	110/76	110/74	120/70	146/96	156/100	150/90
12	Mariammal	31603	59	F	58	110/80	100/70	120/70	110/70	130/70	120/70	110/80	120/76	124/76	140/96	146/98	140/90	130/80	120/80	120/80
13	Indirani	32079	59	F	54	120/80	110/70	120/70	120/70	120/70	120/70	130/80	136/86	120/70	140/80	130/80	130/80	126/86	156/96	169/96
14	Kaliammal	32456	59	F	52	130/80	140/80	126/88	126/88	120/80	126/76	120/80	130/80	136/86	120/84	126/86	146/96	120/80	120/86	126/86
15	Deivanai	30408	59	F	52	140/90	130/86	140/82	130/80	136/86	140/90	130/80	130/80	136/86	136/80	140/90	145/96	156/106	140/96	140/90
16	Panchalai	32901	59	F	55	130/80	120/80	126/88	120/80	128/80	138/88	130/88	130/86	140/80	140/90	136/96	156/106	140/90	130/80	130/80
17	Ganapathy	31625	57	M	58	120/80	124/86	110/76	120/74	120/80	110/80	130/80	130/80	124/76	124/82	126/86	130/80	140/86	150/96	130/80
18	Babu	30482	58	M	52	120/80	120/80	120/80	110/70	120/74	120/80	120/80	120/80	126/74	130/80	140/80	140/86	160/96	130/90	120/80
19	Manikkam	31498	60	M	54	130/80	110/80	130/80	120/80	110/74	128/80	130/80	120/80	150/96	120/80	110/76	120/76	120/80	130/80	120/80
20	Durai	31483	58	M	52	140/80	130/80	110/76	116/76	124/76	130/80	120/80	130/80	130/86	156/106	120/80	126/86	120/80	120/80	120/80
21	Mani	31203	48	M	58	130/80	110/78	130/80	120/76	120/76	120/80	120/86	146/96	120/80	120/80	120/76	126/76	121/76	120/80	120/80
22	Dhanikachalam	34026	58	M	56	130/76	120/70	120/70	110/76	118/76	130/76	120/76	110/76	126/76	130/76	120/80	136/86	146/96	120/76	110/76
23	Ragavan	33749	58	M	58	140/80	126/86	110/76	120/76	126/78	126/86	120/80	120/80	120/80	136/86	156/104	130/80	120/80	120/80	120/80
24	Duraikannu	32891	58	M	58	130/90	130/80	126/80	124/86	120/80	130/80	120/80	120/80	126/86	126/86	120/86	136/86	156/96	130/80	130/80
25	Ganesan	32888	60	M	62	130/80	130/80	120/80	120/80	130/80	116/78	120/80	120/86	136/86	120/80	120/80	130/80	130/86	156/96	120/80
26	Ravi	29515	45	M	54	130/80	120/86	120/76	120/74	126/76	130/80	120/80	120/80	120/86	140/86	130/90	165/96	140/80	130/80	120/80
27	Rani	29482	40	F	52	140/86	140/80	130/80	120/80	128/78	130/80	140/80	140/80	130/80	130/90	136/90	156/106	140/80	140/80	130/80
28	Indirani	33751	50	F	58	140/80	130/80	130/80	120/80	126/78	120/76	130/80	140/80	140/80	140/90	156/96	130/80	130/80	120/80	120/80
29	Jayalakmi	34055	55	F	58	110/70	100/70	120/70	110/76	114/78	120/70	120/70	110/76	120/76	110/76	110/78	120/80	146/96	120/80	120/80
30	Sundaravarathan	31194	60	M	64	130/80	120/80	120/80	120/80	110/74	120/76	120/86	130/80	126/86	136/86	140/80	140/86	140/90	166/106	140/90

MASTER CHART OF GROUP B – PATIENTS RECEIVING

1:1 MIXTURE OF 2% LIDOCAINE AND 0.5 % BUPIVACAINE

SL NO	NAME	IP NO	AGE	SEX	Wt in kg	ONSET OF SENSORY BLOCKADE (min)						ONSET OF MOTOR BLOCKADE (min)						TOTAL DURATION OF ANALGESIA (min)						
						min	1	2	3	5	7	min	3	5	6	8	10	min	0-120	121-240	241-360	361-480	361-480	481-600
1	Sathyavani	29006	43	F	56	3			√			6			2/8			240		√				
2	Unnamalai	29480	40	F	58	2		√				8				2/8		270			√			
3	Dhanalakmi	29007	55	F	56	5				√		10					2/8	210		√				
4	Kasthuri	28635	55	F	58	3			√			5		2/8				270			√			
5	Sarojini	28625	60	F	54	3			√			8				2/8		300			√			
6	Kanniamma	33878	57	F	58	3			√			8				2/8		270			√			
7	Indirani	33753	57	F	62	2		√				6			2/8			240		√				
8	Kaliyammal	33701	60	F	64	3			√			8				2/8		300			√			
9	Santhanamary	33864	60	F	58	2		√				5		2/8				240		√				
10	Anjalai	31224	50	F	58	3			√			10					2/8	210		√				
11	Kasthuri	30406	55	F	62	3			√			6			2/8			420				√		
12	Yasodha	30411	50	F	55	3			√			8				2/8		360			√			
13	Kannammal	30333	56	F	62	2		√				4	2/8					300			√			
14	Annamalai	32604	56	M	65	3			√			6			2/8			360			√			
15	Balakrishnan	30324	60	M	55	3			√			5		2/8				360			√			
16	Rajagopal	30407	57	M	64	2		√				6			2/8			360			√			
17	Madurai	30405	60	M	60	3			√			6			2/8			300			√			
18	Bavani	30398	45	M	52	2		√				6			2/8			300			√			
19	Rajamanikkam	30619	54	M	58	3			√			10					2/8	420				√		
20	Munusami	31228	60	M	58	3			√			8				2/8		270			√			
21	Patchhiyappan	33060	54	M	58	2		√				6			2/8			300			√			
22	Perumal	33058	60	M	58	3			√			6			2/8			360			√			
23	Venkatesan	33227	58	M	62	2		√				5		2/8				270			√			
24	Kannaiyan	31591	50	M	58	2		√				10					2/8	240		√				
25	Balaraman	33754	59	M	64	3			√			5		2/8				300			√			
26	Duraisamy	33757	59	M	68	2		√				6			2/8			240		√				
27	Erusu	33756	55	M	58	3			√			5		2/8				270			√			
28	Murugesan	33755	58	M	58	3			√			5		2/8				270			√			
29	Ellapan	29016	60	M	56	3			√			5		2/8				300			√			
30	Sekar	29049	48	M	58	2		√				4	2/8					300			√			

MASTER CHART OF GROUP B – PATIENTS RECEIVING

1:1 MIXTURE OF 2% LIDOCAINE AND 0.5 % BUPIVACAINE

SL NO	NAME	IP NO	AGE	SEX	Wt in kg	HEART RATE (min)															VISUAL ANALOG SCORE (VAS)														
						0	5	10	15	30	60	120	180	240	300	360	420	480	540	600	0	5	10	15	30	60	120	180	240	300	360	420	480	540	600
1	Sathyavani	29006	43	F	56	88	84	86	88	76	84	86	86	98	86	88	86	88	88	86	0	0	0	0	2	2	2	2	3						
2	Unnamalai	29480	40	F	58	88	86	86	88	72	74	86	86	98	106	86	88	86	86	84	0	0	0	0	0	2	2	2	2	3					
3	Dhanalakmi	29007	55	F	56	96	96	86	86	86	98	86	96	110	88	88	86	88	86	86	0	0	2	0	0	0	0	2	3						
4	Kasthuri	28635	55	F	58	88	86	86	88	86	88	86	88	108	96	88	88	86	88	86	0	0	0	0	2	2	2	2	3						
5	Sarojini	28625	60	F	54	80	88	92	96	74	72	88	78	88	106	96	88	86	88	86	0	0	0	0	2	2	2	2	2	3					
6	Kanniamma	33878	57	F	58	76	76	86	88	88	76	78	86	102	88	86	88	86	78	76	0	0	0	2	2	2	2	2	3						
7	Indirani	33753	57	F	62	78	78	78	76	88	76	86	88	106	98	86	88	86	88	86	0	0	0	0	0	2	2	2	3						
8	Kaliyammal	33701	60	F	64	78	86	86	96	98	74	78	86	88	108	96	88	88	86	86	0	0	0	2	2	2	2	2	2	3					
9	Santhanamary	33864	60	F	58	70	78	86	88	78	76	88	86	98	86	88	86	88	86	88	0	0	0	0	2	2	2	2	3						
10	Anjalai	31224	50	F	58	86	88	78	76	76	86	88	86	102	90	86	88	86	88	86	0	0	0	1	1	2	2	2	3						
11	Kasthuri	30406	55	F	62	86	87	84	82	88	88	86	86	88	88	96	104	90	88	88	0	0	0	0	0	0	2	2	2	2	2	3			
12	Yasodha	30411	50	F	55	76	76	80	86	88	88	78	78	88	96	108	96	88	86	88	0	0	0	2	2	2	2	2	2	2	3				
13	Kannammal	30333	56	F	62	86	86	84	80	88	88	86	88	88	110	96	88	86	88	88	0	0	0	2	2	2	2	2	2	3					
14	Annamalai	32604	56	M	65	88	86	86	88	76	88	80	86	84	86	96	80	86	88	86	0	0	0	0	0	2	2	2	2	2	3				
15	Balakrishnan	30324	60	M	55	76	88	76	78	76	78	78	86	86	90	104	90	88	86	86	0	0	0	0	0	2	2	2	2	2	3				
16	Rajagopal	30407	57	M	64	56	54	54	56	54	56	56	76	72	96	94	92	88	58	56	0	0	0	0	2	2	2	2	2	2	3				
17	Madurai	30405	60	M	60	78	86	88	86	78	88	88	88	88	108	96	88	86	88	88	0	0	0	0	2	2	2	2	2	3					
18	Bavani	30398	45	M	52	76	86	86	78	74	76	76	86	76	96	98	96	78	78	80	0	0	0	0	2	2	2	2	2	3					
19	Rajamanikkam	30619	54	M	58	58	56	58	54	54	56	58	56	66	68	66	76	68	66	62	0	0	0	0	0	0	2	2	2	2	2	3			
20	Munusami	31228	60	M	58	88	84	84	86	76	74	86	84	106	88	86	88	84	82	86	0	0	2	2	2	2	0	0	3						
21	Patchhiyappan	33060	54	M	58	86	86	76	78	78	88	88	88	86	106	88	88	86	88	88	0	0	0	0	2	2	2	2	2	3					
22	Perumal	33058	60	M	58	88	88	86	88	76	76	76	76	88	88	98	90	88	88	86	0	0	0	0	0	2	2	2	2	2	3				
23	Venkatesan	33227	58	M	62	88	88	88	86	78	76	86	86	90	102	88	86	88	86	88	0	0	0	0	0	2	2	2	2	2	3				
24	Kannaiyan	31591	50	M	58	58	58	58	60	66	58	58	64	88	64	66	64	66	56	58	0	0	0	0	2	2	2	2	3						
25	Balaraman	33754	59	M	64	80	88	86	84	82	86	88	86	82	98	80	86	88	88	86	0	0	0	2	2	2	2	2	2	3					
26	Duraisamy	33757	59	M	68	58	58	62	64	58	58	66	66	88	66	65	66	68	66	56	0	0	2	2	2	2	2	2	3						
27	Erusu	33756	55	M	58	78	78	86	86	82	88	88	88	108	90	88	86	88	86	88	0	2	2	2	2	2	2	2	3						
28	Murugesan	33755	58	M	58	56	56	56	58	60	62	62	66	88	66	64	62	60	56	58	0	0	0	2	2	2	2	2	3						
29	Ellapan	29016	60	M	56	88	88	88	96	90	86	86	86	82	104	88	86	88	86	88	0	0	0	2	2	2	2	2	2	3					
30	Sekar	29049	48	M	58	76	76	80	86	76	74	88	86	88	106	96	88	88	88	88	0	0	0	0	2	2	2	2	2	3					

MASTER CHART OF GROUP B – PATIENTS RECEIVING

1:1 MIXTURE OF 2% LIDOCAINE AND 0.5 % BUPIVACAINE

SL NO	NAME	IP NO	AGE	SEX	Wt in kg	Blood Pressure (mm of Hg)														
						0	5	10	15	30	60	120	180	240	300	360	420	480	540	600
1	Sathyavani	29006	43	F	56	120/80	110/70	120/80	110/70	120/70	120/70	120/80	120/80	140/96	120/80	120/80	110/70	110/70	130/70	120/80
2	Unnamalai	29480	40	F	58	110/70	120/76	120/70	120/70	110/70	110/70	110/70	110/70	130/86	156/96	120/80	110/70	110/70	116/76	110/76
3	Dhanalakmi	29007	55	F	56	140/88	130/86	120/80	130/80	120/80	120/80	120/80	136/90	166/106	130/80	140/86	130/80	130/80	130/80	130/80
4	Kasthuri	28635	55	F	58	130/80	120/80	110/70	120/80	120/80	120/70	120/80	130/80	156/96	130/80	120/80	120/80	120/80	120/80	120/80
5	Sarojini	28625	60	F	54	110/70	120/80	130/80	120/76	110/76	126/76	120/70	112/76	130/80	146/106	120/76	120/76	130/70	120/70	130/76
6	Kanniamma	33878	57	F	58	120/78	126/76	130/80	130/80	114/76	120/70	130/80	126/76	166/96	130/80	120/80	120/80	120/80	120/80	110/76
7	Indirani	33753	57	F	62	116/76	110/70	128/78	130/80	126/76	120/80	120/80	120/78	156/102	120/80	120/80	120/80	110/76	120/76	120/76
8	Kaliyammal	33701	60	F	64	120/76	120/80	120/80	120/80	110/70	120/70	130/80	126/76	126/86	140/96	120/80	120/80	120/80	120/80	120/76
9	Santhanamary	33864	60	F	58	140/80	130/80	140/80	120/80	110/76	120/76	120/80	126/86	146/104	120/80	120/76	126/76	128/76	120/76	120/78
10	Anjalai	31224	50	F	58	140/80	130/80	130/80	120/80	130/80	120/80	110/70	140/80	156/96	120/80	120/86	126/86	120/80	120/80	120/80
11	Kasthuri	30406	55	F	62	120/80	130/80	120/80	120/80	120/80	130/80	120/80	126/86	130/80	140/80	140/80	158/98	140/80	130/80	120/80
12	Yasodha	30411	50	F	55	110/70	124/76	130/80	130/80	110/70	120/70	130/80	126/80	120/76	130/80	156/108	140/80	130/80	130/80	130/80
13	Kannammal	30333	56	F	62	120/86	130/80	120/80	120/80	130/80	120/80	120/80	126/76	120/80	156/98	140/80	130/80	120/76	120/76	126/78
14	Annamalai	32604	56	M	65	130/80	130/80	140/80	130/80	126/76	128/78	120/80	126/76	126/80	130/88	166/96	126/86	120/80	120/80	120/80
15	Balakrishnan	30324	60	M	55	116/76	110/76	120/76	120/70	130/74	110/70	120/80	130/86	128/78	140/80	158/106	130/80	120/80	120/80	130/80
16	Rajagopal	30407	57	M	64	130/80	120/80	126/86	110/76	120/80	120/80	130/80	120/76	128/80	140/80	146/96	120/80	120/80	114/76	116/74
17	Madurai	30405	60	M	60	130/80	130/80	126/86	124/78	130/80	126/78	130/80	120/80	130/80	156/98	130/80	120/80	120/80	126/76	126/76
18	Bavani	30398	45	M	52	130/80	120/80	136/86	124/82	126/88	120/80	130/80	126/78	130/80	156/106	140/80	130/80	120/80	120/80	120/80
19	Rajamanikkam	30619	54	M	58	130/80	130/80	130/80	120/80	130/80	130/80	120/80	130/80	120/80	130/80	140/80	156/96	120/80	120/80	130/80
20	Munusami	31228	60	M	58	130/80	130/74	130/80	130/80	128/76	130/80	120/80	120/80	166/106	140/90	130/80	130/80	120/80	130/80	120/76
21	Patchhiyappan	33060	54	M	58	120/80	130/80	126/80	130/80	120/80	126/76	120/78	120/80	120/80	166/96	130/80	140/80	120/80	126/86	120/80
22	Perumal	33058	60	M	58	140/80	126/76	126/76	126/74	126/76	120/76	120/76	120/80	130/80	130/80	156/96	130/80	140/80	130/80	120/80
23	Venkatesan	33227	58	M	62	140/80	120/80	120/76	124/76	130/80	130/80	130/80	140/80	140/90	165/96	130/80	126/76	126/78	130/80	130/80
24	Kannaiyan	31591	50	M	58	120/76	128/78	126/76	124/78	130/80	120/80	130/80	140/80	158/98	130/80	120/80	120/80	130/80	130/80	130/80
25	Balaraman	33754	59	M	64	130/80	120/80	130/80	140/80	126/76	130/76	130/80	120/80	130/80	160/96	120/80	130/80	130/80	140/80	130/80
26	Duraisamy	33757	59	M	68	120/80	120/80	126/76	126/78	126/80	120/80	130/80	140/80	166/96	130/80	130/80	120/80	120/80	130/80	120/80
27	Erusu	33756	55	M	58	130/86	120/80	120/80	120/80	120/80	126/78	130/80	120/86	156/98	130/80	120/80	130/80	120/80	130/80	120/80
28	Murugesan	33755	58	M	58	130/80	130/80	130/80	120/80	126/78	116/76	120/80	126/80	156/96	130/80	120/80	130/80	120/80	120/80	120/80
29	Ellapan	29016	60	M	56	140/80	140/80	130/80	130/80	120/80	120/80	120/80	130/80	136/80	154/98	130/80	130/80	120/80	130/80	130/80
30	Sekar	29049	48	M	58	120/76	126/76	124/78	126/78	120/80	120/80	130/80	120/80	130/80	156/106	130/80	130/80	130/80	120/80	130/80